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Bottom-up design process of agri-environmental measures at a landscape scale: Evidence from case studies on biodiversity conservation and water protection

Marco Toderi[a,*], Matteo Francioni[a], Giovanna Seddaiu[b], Pier Paolo Roggero[b], Laura Trozzo[a], Paride D'Ottavio[a]

[a] Dipartimento di Scienze Agrarie, Alimentari ed Ambientali, Università Politecnica delle Marche, Via Brecce Bianche, 60131 Ancona, Italy
[b] Dipartimento di Agraria and Nucleo di Ricerca sulla Desertificazione, Università degli Studi di Sassari, Viale Italia 39, 07100 Sassari, Italy

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ABSTRACT

An Agri-environmental measure (AEM) is a payment to farmers to reduce environmental risks or to preserve cultivated landscapes. The single farm scale that is the basis for the AEM has often inhibited the achievement of the environmental goals since many biophysical processes (e.g. soil erosion, water pollution, biodiversity losses) occur at landscape scale. This creates a spatial scale mismatch between the implementation scale of the measures and the ecological processes controlling the target agri-environmental issues. In this paper, we propose how to address this spatial scale mismatch by analysing nine case studies of AEMs implementation at landscape scale concerning biodiversity conservation and water protection. The analysis highlights that the inclusion of the landscape scale in AEMs depends on the level of the involvement of the local stakeholders (SH) in the building process. When the authorities created the space for the SHs to participate in the defining process of AEMs, the inclusion of local knowledge led to the emergence of new landscape and site-specific AEMs which were not previously considered by the autorities. On the contrary, when the SHs were only allowed to choose among the AEMs predefined by the authorities, many site specificity and acceptance issues arose. The creation of space in Rural Development Programmes for collaborative, bottom-up and landscape scale AEMs and the overcoming of institutional constraints in the design of specific actions are the key ingredients for the successful adoption of measures and for enhancing their effectiveness. In this paper, we explore in depth what made these stories successful and provide a framework for the implementation of site-specific and landscape AEMs.

1. Introduction

To support sustainable development of rural areas and to respond to increasing demands for environmental quality by society, the European Union (EU) introduced agri-environmental measures (AEMs) in 1985, with Council (EEC) Regulation 797/85. Later, the EU prescribed the mandatory implementation of agri-environmental programmes for all Member States (EEC Regulation 2078/92). The Agenda 2000 Common Agricultural Policy reform (EEC Regulation 1257/1999) then transferred AEMs into Rural Development Programmes (RDPs) (Defrancesco et al., 2008).

Agri-environmental measures can be defined at different levels (i.e., national, regional, local), and they are adopted by farmers on a voluntary basis. Most AEMs are management agreements that give compensation payments for the temporary adoption of specific practices, such as input-reduction, and landscape and habitat conservation measures (Uthes and Matzdorf, 2013). Several studies have highlighted the limitations of such AEMs. For example, some studies have stressed the "patchy success" of AEMs (Jones et al., 2016; Kleijn et al., 2006; Sutherland, 2004), with the objectives often too vague (Prager and Nagel, 2008). Others have stated that AEMs are not always suited for all kinds of farms (Evans and Morris, 1997; Hodge and Reader, 2010), and over/under compensation can be expected, in addition to several application problems (Klimek et al., 2008). On the other hand, there is evidence that the landscape spatial organisation can affect environmental processes like biodiversity conservation (Benton et al., 2003; Joannon et al., 2008; Kleijn and Sutherland, 2003) and water pollution (Beaujouan et al., 2001; Benoit et al., 1997; Toderi et al., 2007).

Existing incentive programmes typically neither require nor encourage landscape coordination, but instead favour a farm-level approach. However, many of the biophysical and ecological processes in agriculture do not occur at the farm level, but at the landscape scale (Kleijn et al., 2011; McKenzie et al., 2013; Prager et al., 2012). For these reasons, AEMs at the farm level can generate problems of spatial scale mismatch (Armitage et al., 2008; Cumming et al., 2006; Pelosi et al., 2010; Toderi et al., 2007).

The integration of knowledge from different stakeholders (e.g., farmers, scientists, experts) is considered a precondition for successful sustainable land management (Schwilch et al., 2012; Tarrasón et al., 2016). Participatory approaches and system perspectives for the identification and selection of options are becoming increasingly popular, and are required by the EU RDP (Prager and Freese, 2009). However, the unknown outcome for policy makers of a participatory process can limit its institutionalisation (Reed, 2008), and at all political levels, a big gap remains in the broad implementation of participatory processes (Rauschmayer et al., 2009). Stakeholder participation is increasingly seen as insufficient, and attention has shifted to social learning, co-management and empowerment goals as key issues (Armitage et al., 2008; Reed et al., 2008; Selin and Chavez, 1995).

Because the adoption of AEMs by farmers is voluntary, a high level of acceptance is required for their successful implementation. The perceived risk, effectiveness, scale of application (i.e., field, farm, landscape), and time and effort required for the implementation of measures are important factors that affect the willingness of farmers to join AEMs (McKenzie et al., 2013; Sattler and Nagel, 2010; Uthes and Matzdorf, 2013).

To involve stakeholders in the design of AEMs, and to overcome the spatial scale mismatch generated by the field/farm level approach, the authority responsible for the control and coordination of RDPs in the Marche Region (central Italy) provided for agri-environmental agreements at the landscape scale (AEAs) in the RDP of 2007–2013 (Regione Marche, 2016). An AEA is defined as an agreement between public and/or private stakeholders to apply one or more shared AEMs in a specific territory of the region (e.g., a river basin, a protected area) above the level of farm, field or local-scale administration, with this designed to manage an environmental issue with a landscape dimension (e.g., water pollution, biodiversity conservation).

In the present study, we analysed how different AEAs and their AEM design process in nine case studies led to AEMs that are site-specific and/or that take into account biophysical phenomena on a larger scale with respect to the farm (a scale defined as "landscape AEMs" in this article). We also discuss how the differences between design processes: (i) affect local knowledge inclusion and stakeholder empowerment; (ii) have effects on the ability of stakeholders to generate innovative AEMs; and (iii) affect the degree of acceptance of the AEMs. From the analysis of these different case studies, we identified a design process of shared, site-specific and/or landscape AEMs with new roles for stakeholder involved.

2. Materials and methods

2.1. AEAs in the Marche Region RDP 2007–2013

According to the AEA procedure, stakeholders have to identify a lead partner who is responsible for: (i) administering an AEA; (ii) involving the stakeholders in a participatory process for AEM discussions; and (iii) planning the changes in the RDP with the regional authority (Regione Marche, 2010, 2011). In RDP 2007–2013, the Marche Region identified four major local environmental priorities on which to activate AEAs (Table 1). During the 2007–2013 planning period, the Marche Region activated AEAs exclusively on two of the priorities for which the stakeholders showed interest: one AEA on water pollution (WP AEA), and six AEAs on biodiversity (BIO AEAs) (Fig. 1). Two other attempts to create additional BIO AEAs were made, but these failed.

Here, we also analyse the causes of these failures.

The WP AEA was activated in the Aso River valley, to reduce the high input of pesticides used in pest management by the dominant tree-fruit production-oriented farms. This included the territory of 15 municipalities, which were partially included in a Nitrate-Vulnerable Zone (NVZ) (EU Directive 91/676/CEE, and further modifications).

The BIO AEAs involved different Natura 2000 areas in terms of the pedo-climatic, environmental and socio-economic conditions. Five of the BIO AEAs were located in mountain areas, and one along the Adriatic coast. Natura 2000 sites in the Marche Region cover 136,900 ha, which corresponds to over 14% of the total area of the region. Specifically, the BIO AEAs require conservation of grassland habitats, as mainly the EU classifications of: 6210*, Semi-natural dry grasslands and scrubland *facies* on calcareous substrates (*Festuco-Brometalia*) (*important orchid sites); and 6510, Lowland hay meadows (*Alopecurus pratensis*, *Sanguisorba officinalis*), in the mountain areas where most of the grasslands are common pasturelands mainly subjected to customary grazing rights.

2.2. Theoretical framework adopted in the AEA analysis

The agri-environmental issues that occur at larger spatial dimensions than the farm/field level are often resource dilemmas that are characterised by common pool resources, multiple stakeholders, interdependence, controversy, complexity and uncertainty (Blackmore, 2007; Ison et al., 2007). Inefficiencies occur and/or important components of the system are lost when there is a lack of alignment between the scale of the environmental variation and the scale of the social organisation, in which the responsibility for management resides. This can thus generate spatial scale mismatches. In these systems, long-term solutions will depend on social learning and the development of flexible institutions that can adjust and reorganise in response to changes in ecosystems (Cumming et al., 2006).

Reed et al. (2009) defined social learning as a change in understanding that goes beyond the individual, to become situated within wider social units or communities of practice through social interactions between actors within social networks. Collins and Ison (2010) considered social learning as an alternative governance mechanism and a process of systemic change and transformation undertaken by stakeholders in complex situations. Although more than one definition of social learning is available, the literature generally uses this term to refer to a "sustainability" type of transformative change that occurs at different levels, and in this, social learning is framed as a normative goal (Rodela, 2014). Armitage et al. (2008) analysed three potential loops of learning for co-management: fixing errors from routines (single loop); correcting errors by adjusting values and policies (double loop); and correcting errors by designing governance norms and protocols (triple loop).

Berkes (2009) identified the need for co-management for natural resources (i.e., the sharing of power and responsibility between government and local users), because of its complexity. Indeed, it is difficult for any one group or agency to have the full range of knowledge for environmental governance, and so the different partners have the potential to bring knowledge that is acquired at different scales to the discussion table, which will facilitate social learning. The important features of co-management include the sharing of authority, partnerships of government and local people, decentralised decision making, and vertical linkages for governance (Galappaththi and Berkes, 2015). Time-tested co-management with learning-by-doing turns into adaptive co-management. This can evolve spontaneously through feed-back learning over time from simple systems of management, and even if it does not appear to require legal arrangements to enable it, these might be required to sustain it (Galappaththi and Berkes, 2015). In this article, we highlight how legal arrangements that favour co-managment derive from a shift in the roles of policy makers in the system. When the shift in the roles of the policy makers does not occur, the co-management